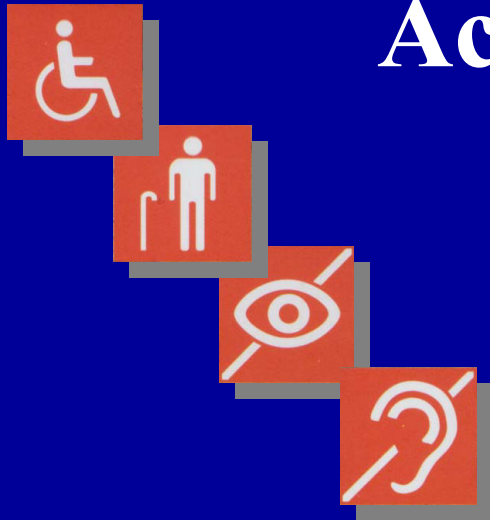


Accessibility and Evacuation Planning

Similarities and Differences



Dr. Judith Bendel - Access Unlimited

Dr. Hubert Klupfel - TraffGo

The Goal:

Evacuation Planning for All



Facts in Numbers

People with special access needs:
20-24% of the world population

Meaning:

- 45 million Americans
- 42 million in the European Community
- 4 Million Australians

An additional 10% are elderly (The number of people with disabilities increases with age).

Who are people with special access needs?



Wheelchair users



Limited mobility



Visually impaired



Hearing impaired

Cognitively disabled
Mental disorders

Visibility of disability

| Disability | Visible | Invisible |
|----------------------------|--|---------------------------------|
| Mobility Impaired | Wheelchair, Crutches, Walker, Deformation | Heart condition, equilibrium |
| Sensory Impairment | Guide dog, Cane, Telescopic glasses, Hearing aid | No external aids |
| Intellectual impairment | Facial looks, Expression | No external indication |
| Learning disabilities | Prominent behavior | No external indication |
| Mental disorder | Appearance, Expression | No external indication |

The Law for Equal Rights



Stands for:

“elimination of discrimination against individuals with disabilities in all aspects of life”



Mandatory:

- physical, sensory & psycho-social accessibility to all public institutions – new and old. (including public transportation, public space - streets, shopping, recreation, nature sites, historic sites etc.)
- accessible services (including technology base aids and devices)

Therefore:

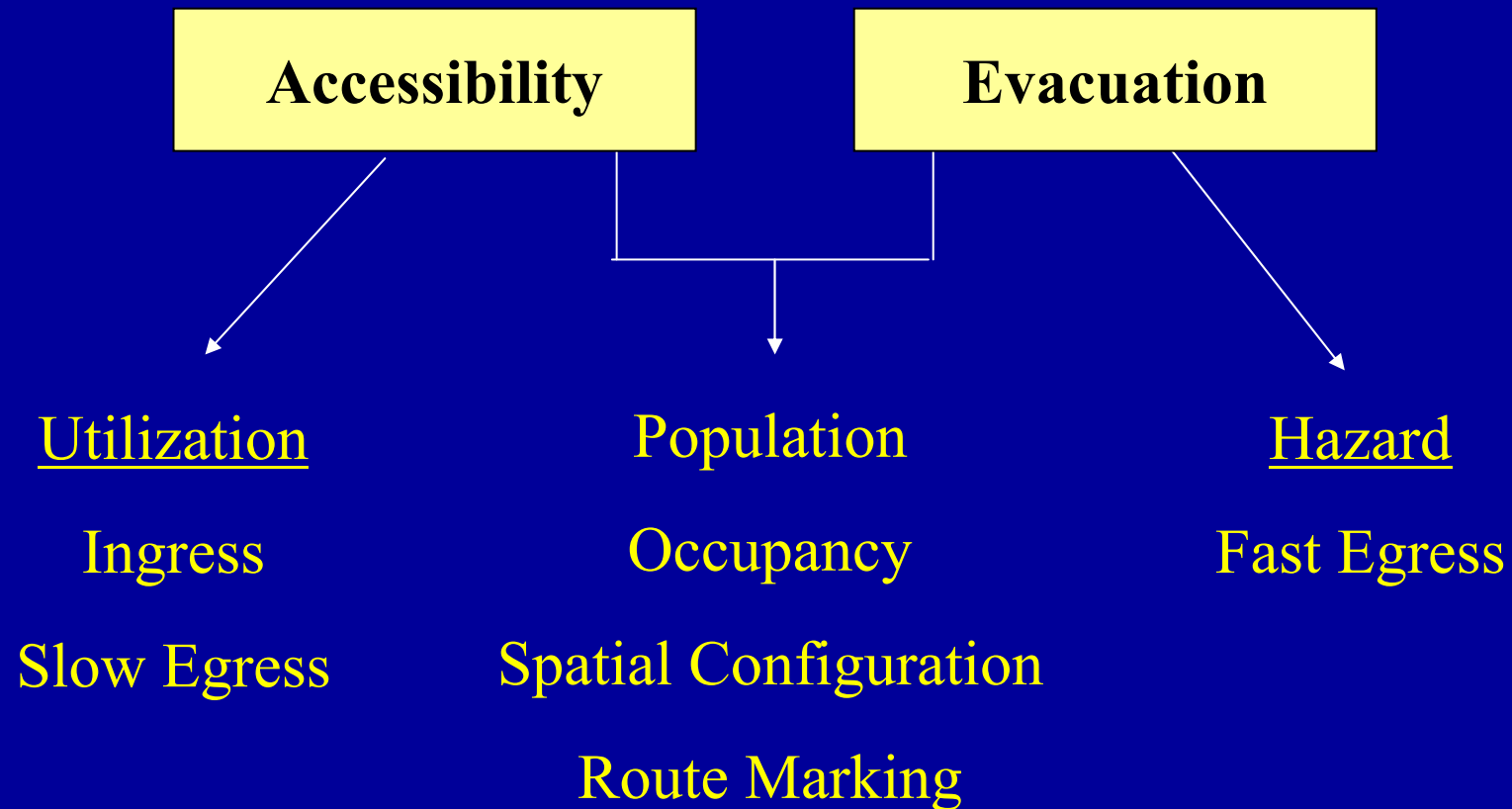
- **Accessibility** of a facility must be an integral aspect of the design
- The **evacuation** concept for a building must take into account aspects specific to people with disabilities

Accessibility and Evacuation

Correspond to and complement each other

- “**Accessibility**”: related to universal design – involves "direct access." Making the environment accessible to all people (whether they have a disability or not).
- “**Emergency evacuation**” is the immediate and rapid movement of people away from the threat or a hazard.

Similarities and Differences



The “Time” Factor

- Accessibility: time plays no decisive role
→ $ASAT = \infty$
- Evacuation: Criterion $ASET > RSET$
has to be met for safe evacuation
→ $ASET = (\text{e.g.}) 15 \text{ min.}$

$$ASAT > ASET$$

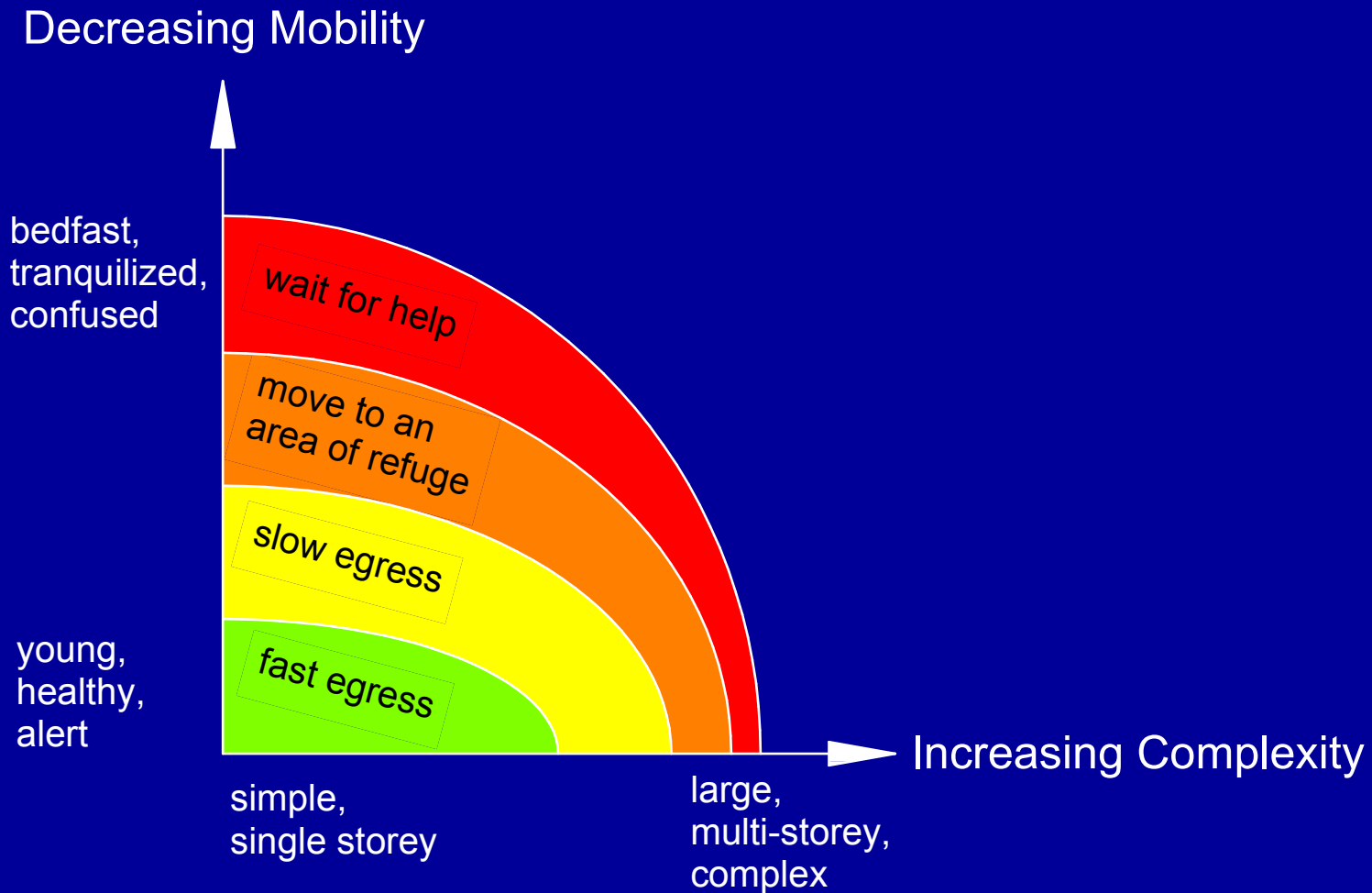
Imbalance: Use of Elevators



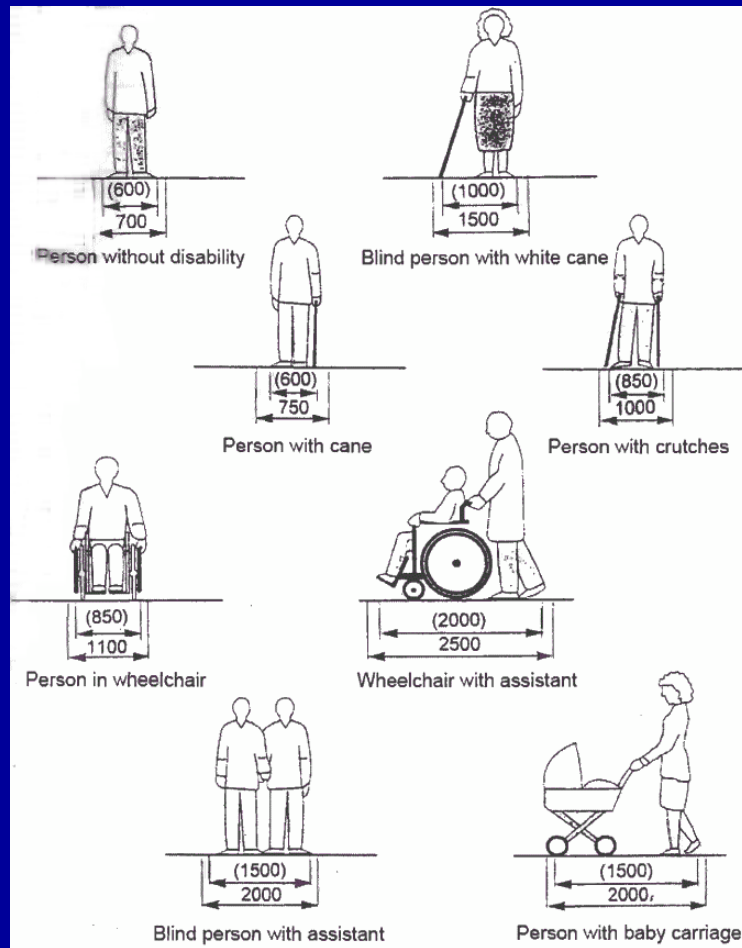
Ingress ← → Egress

Figure taken from www.mysafetysign.com

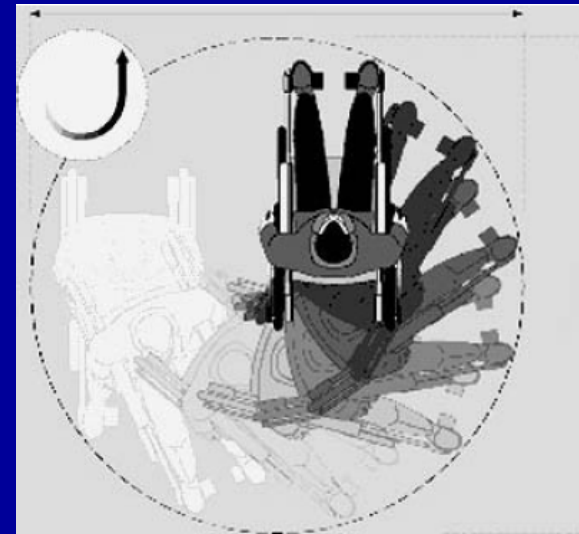
Mobility, Complexity, and Strategy



Spatial Needs: Dimensions



Reference: Buchmüller



$r = 1800 \text{ mm}$

Reference: www.sustainable-design.com

Accessibility elements which have an impact on evacuation:

Egress routes (do not include stairs, steps, or escalators)

- **Length** of route (Travel distance)
- **width**
- **Passing Space**
- **Head Room**
- **Surface Textures** (such as carpet, slippery surface, uneven surface etc)
- **Slopes**
- **Doors**

Continue:

- **treatment of elevation changes:** a curb ramp, ramp, elevator, or platform lift
- Evacuation elevators
- Signage
- Alarms
- Stairways

Example: Signage

Location, letter size and shape



Symbols, text, location



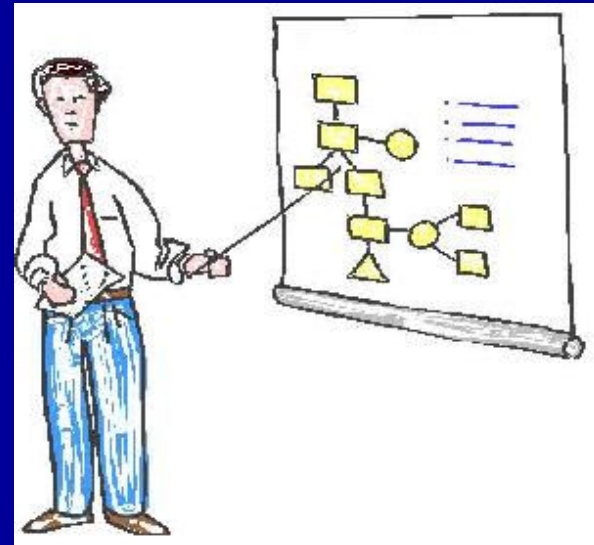
clarity



Evaluating Accessibility Model

Objectives:

- To **analyze** access information in a systematic way for wide range of people with disabilities
- To present **processed** access information in useful and a clear way across counties.

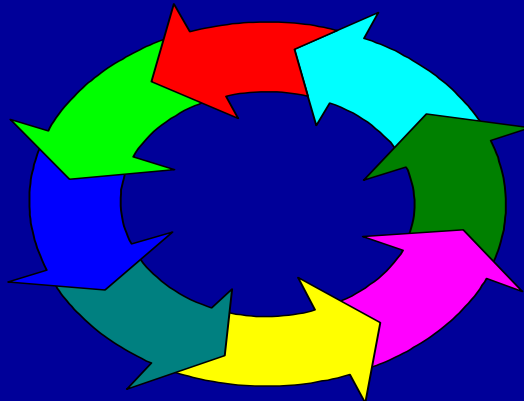


Challenges

- Accessibility is a result of the combination of many details.

Each detail does not stand alone.

There are many possible interactions

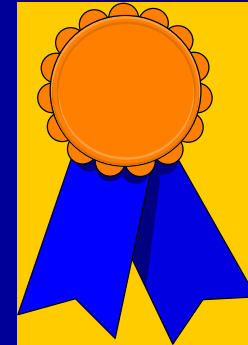


- Unique design of sites/ buildings have to be considered

- There are guidelines but no official audit tools to assess accessibility
- Various types of disabilities have different access needs

The decision support and scoring system model

- The system focuses on the interaction between the individual and the environment
- The system is a computerized audit tool which is grading the findings.
- Our scoring system operates on 2 sets of mathematical equations for each type of disability. generating bias free scores to define accessibility:
 1. For each element and facility separately
 2. For the site as a whole



Site Grades



1

Inaccessible



2

**or Partially accessible
requires assistance**



3

**Accessible but does not
meet the standards**



4











**Accessible according to
standards**

Data input


Update Empty Question Grades

Site Questions

Site Name
Site ID

| Nb. | Question | W | M | V | H |
|--|-----------------------|---|---|---|---|
|  3 | PUBLIC TRANSPORTATION | 9 | 2 | | |
|  4 | PARKING | 2 | 2 | | |
|  5 | ENTRANCE TO SITE | 1 | 1 | 1 | 9 |
|  6 | MAIN ENTRANCE | 1 | 1 | | |
|  8 | ACCESSIBILITY INDOORS | 2 | 2 | 9 | |
|  9 | ELEVATOR | 1 | 1 | 9 | |
|  10 | PUBLIC W.C. | 2 | 2 | | |
|  11 | PUBLIC W.C. 2 | 3 | 2 | | |
|  12 | ROOMS | 2 | 2 | | |
|  13 | ADJOINED BATHROOM | 3 | 2 | | |


Compute Site Grade



To remove a Question, Select from List

To Add a Question, Select from List

ASSIGNED POPULATION 2
SECONDARY ENTRANCE 7
TRANSPORTATION AT SITE 18
AID INSTRUMENT 20
TOUR DURATION 26
SPECIAL PROGRAM/ACTIVITY FOR DISABLED 27
BOOKING 28
PAYMENT 29



Site Update - Answers to Questions

Answers to Questions







Compute
Grade

Site Name Alumot Country Lodging

Site ID 079700

Question PARKING

Question Nb. 4

| | Answer | Nb. | |
|--|--|-----|----------------------|
|  | No reserved disabled parking in lot | 112 | <input type="text"/> |
|  | Accessible parking lot | 121 | <input type="text"/> |
|  | Ramp/slope to pavement in the parking lot | 131 | <input type="text"/> |
|  | Open-air parking lot | 142 | <input type="text"/> |
|  | Asphalt parking lot | 151 | <input type="text"/> |
|  | Not necessary to cross road from parking lot to si | 162 | <input type="text"/> |

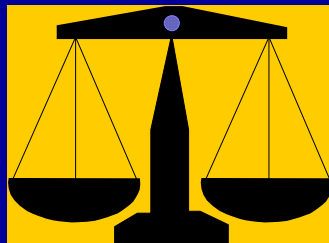
Comment



To Add an Answer, Select from List and Double Click

Grading system:

- Answers a wide range of access needs for each type of disability
- **Weight accessibility** based on the combination of building specific **and** disability specific criteria



- Equations are **built in** - thus enable instant data analysis while data input
- Does not require **personal judgement**
- **Personal impression** does not have an impact on grades

Evacuation Simulation



Relation Accessibility and Evacuation

- Generally: an accessible (barrier-free) building is required for evacuation
- an accessible building is not necessarily easy to evacuate
→ evaluation by e.g. simulation

Planning Guide



Emergency Evacuation Planning Guide For People with Disabilities

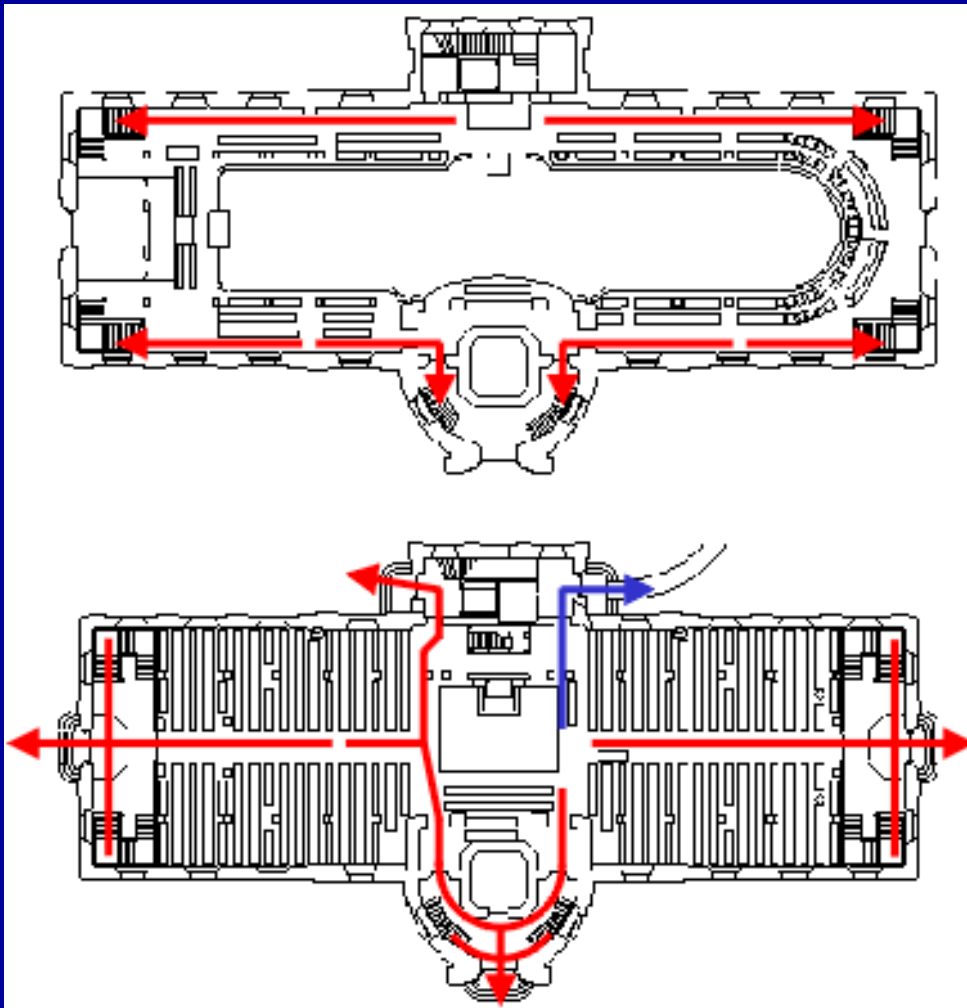
Building Evacuation System

- Circulation Path (unobstructed way)
 - Occupant Notification Systems
 - Directions to and through circulation path
- Usable Circulation Path: „A person with disabilities is able to travel unassisted through the path...“
(NFPA Evacuation Guide for People with Disabilities)

Elements of Evacuation Information

- Notification (correct response?)
- Way finding (which route?)
- Use of the way (self-rescue possible?)
- Assistance (which kind of assistance?)

Floor Plan



Gallery:

Seated: 202

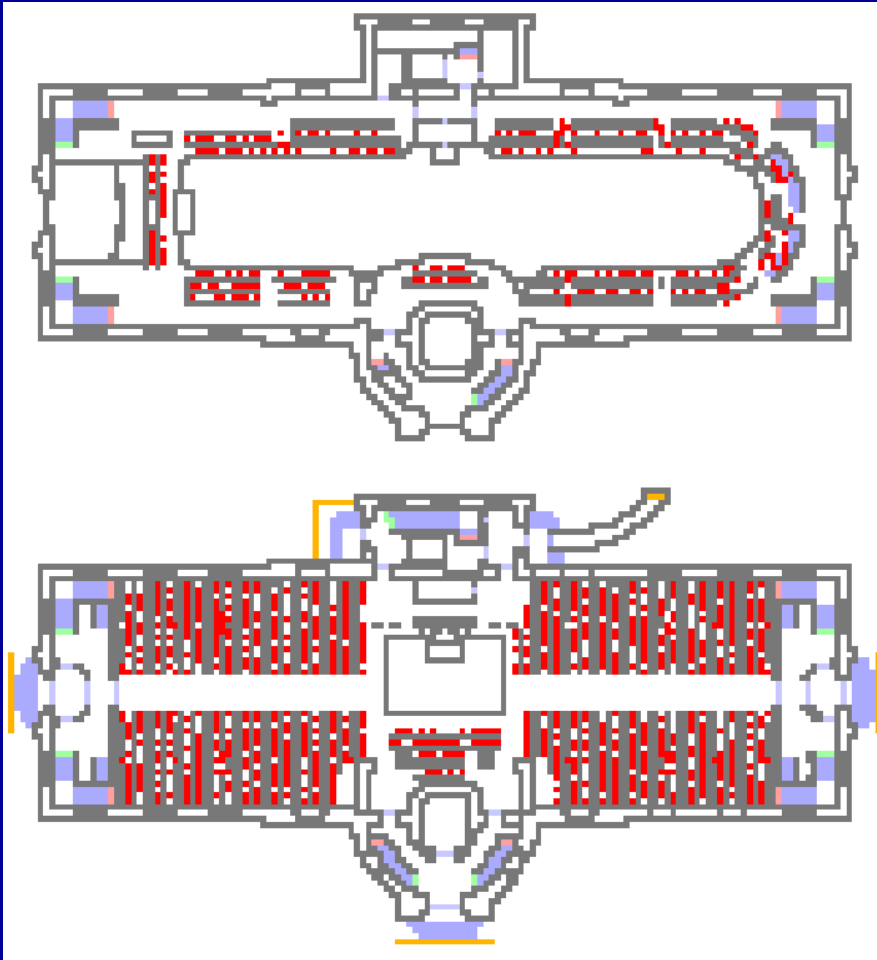
Choir: 24

Ground Floor:

Seated: 788

Wheelchairs: 5

Model



Gallery

Ground Floor

Demographics

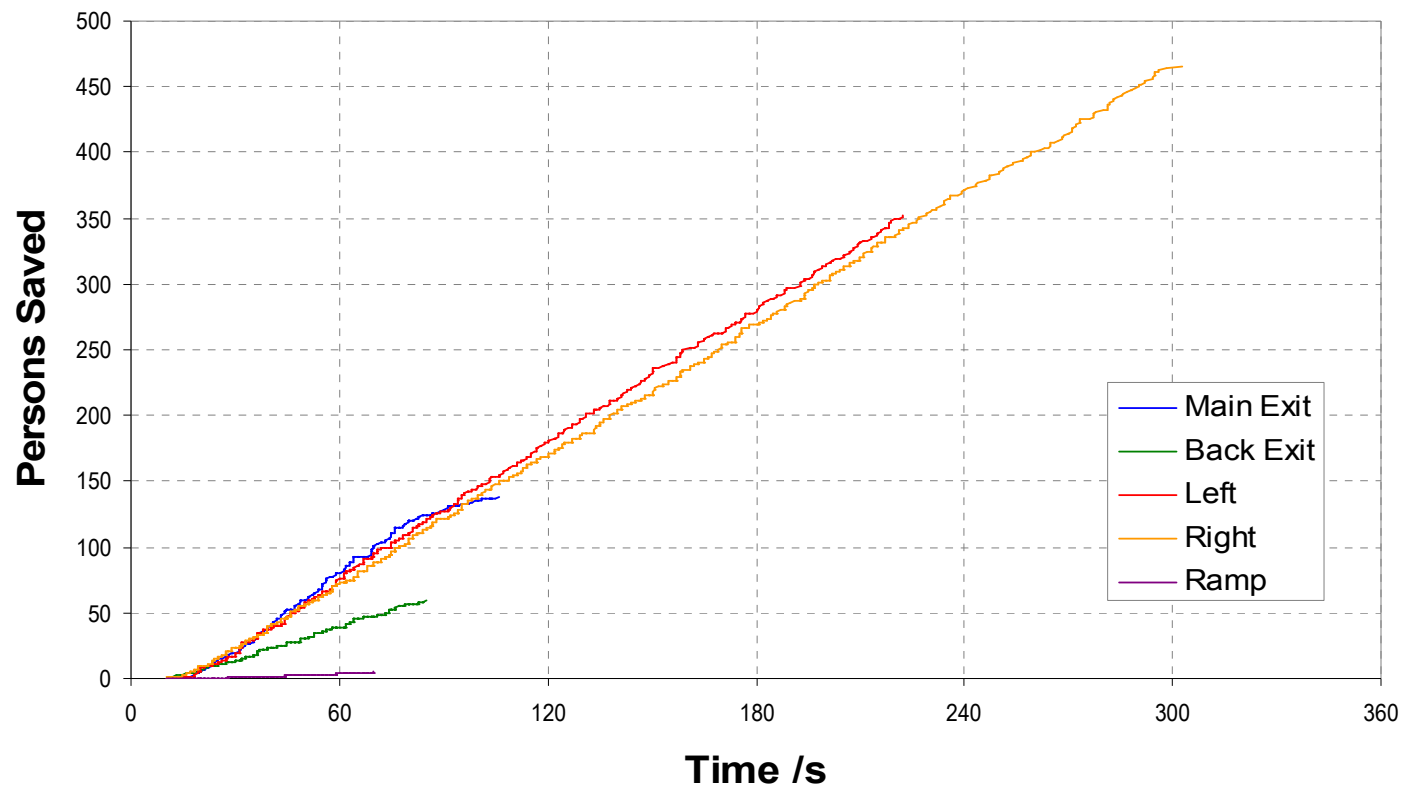
Standard Population

| | Min | Max | Mean | Std.-Dev. | Unit |
|----------|------|------|------|-----------|------|
| Velocity | 0.8 | 2.0 | 1.2 | 1 | m/s |
| Patience | 5000 | 5000 | - | - | s |
| Sway | 1 | 5 | 3 | 2 | |
| Reaction | 0 | 60 | 30 | 300 | s |
| Dawdle | 0 | 30 | 15 | 5 | % |
| Inertia | 1 | 5 | 3 | 2 | % |

“Wheelchair Users”

| | Min | Max | Mean | Std.-Dev. | Unit |
|----------|-----|-----|------|-----------|------|
| Velocity | 0.8 | 0.8 | - | - | m/s |
| Sway | 1 | 1 | - | - | |
| Dawdle. | 0 | 50 | 25 | 250 | % |

Results



Summary

The main difference:

- The role of the time factor
- Simulation model is not based on the interaction and integration of the building elements

Conclusion:

- Accessibility is the requirement for evacuation
- Universal building designed by definition should provide for improved evacuation routes and procedures
- Additional evacuation planning for people with disabilities is necessary



Recommendations

- Awareness for design consequences
- Accessibility aspects should be combined while simulating the evacuation:
 - Information items should be added to the CAD plan
 - The accessibility grades (results of the accessibility analysis) should be incorporated in the simulation model
 - Accessible facilities should have an impact on parameters used in the PedGo evacuation simulation model

Thank You



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